

文章编号: 0454-6296 (2000) 04-0394-09

New records and new species of fresh water springtails from China (Collembola)

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Abstract: Five species including one new species of the fresh water springtails collected from a pond in Shanghai Botanical Garden have been described: *Podura aquatica*, *Hypogastrura yinae* sp. nov., *Isotomurus palustris*, *Sminthurides aquaticus* and *Pseudobourletiella spinata*. *Sminthurides aquaticus* and *Pseudobourletiella spinata* are recorded from China for the first time. All the specimens examined are deposited in the Museum of Shanghai Institute of Entomology, the Chinese Academy of Sciences.

Key words: Collembola; new species; new record; China

Although Collembola may not be aquatic in a strict sense^[1~2], many species demonstrate a strong affinity for aquatic and semiaquatic habitats. Several works have dealt specifically with the fresh water Collembola fauna in the world^[2~5]. There were no other record of Chinese fresh water springtails since Uchida (1948)^[6] described the first Chinese fresh water species of Collembola, *Podura aquatica* Linnaeus, 1758 from Dongye, Shanxi Province. This is the first time to describe specifically fresh water collembolans in China.

Podura aquatica Linnaeus, 1758 (Figs. 1~9)

Synonym: *Hypogastrura aquatica* Bourlet, 1893

Podura granulata MacGillivray, 1893

Achorutes aquaticus Gervais, 1841

Podura f. mimuia Maynard, 1951

Body length: 1.7 mm.

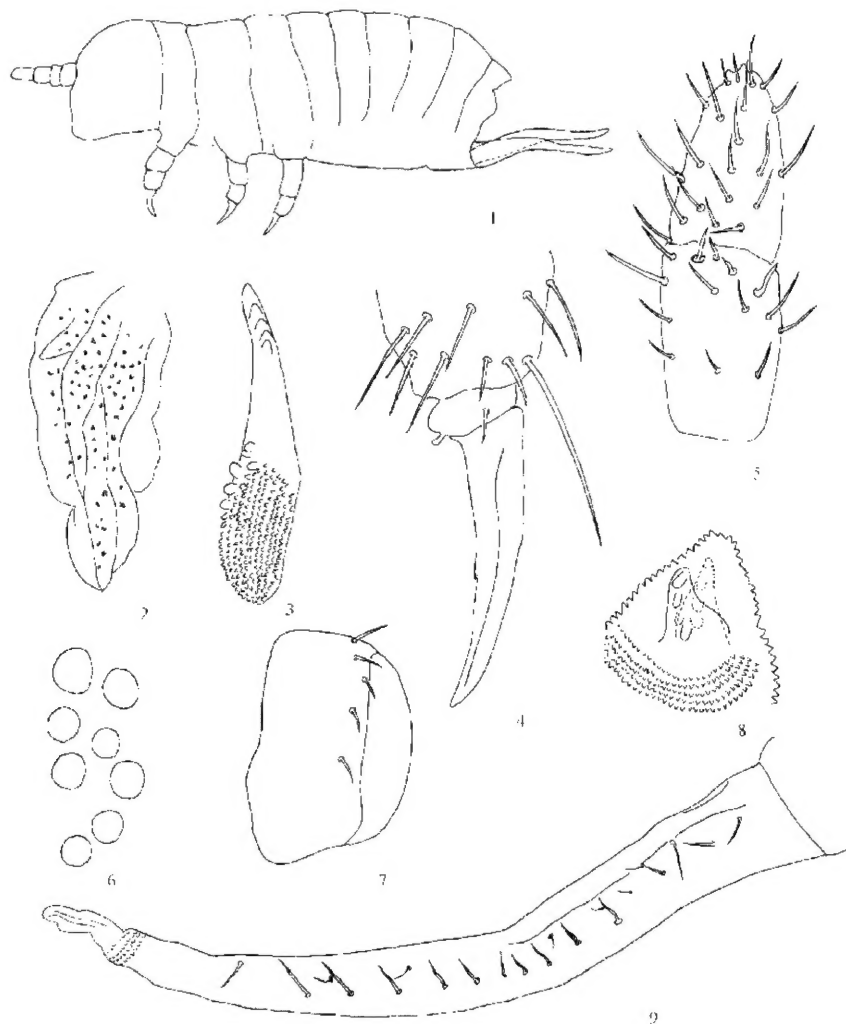
Colour: blackish blue.

Head: Antennae shorter than head, ratio to head 0.75. Length ratio of Ant. I : II : III : IV as 4:4:5:5. Ant. III organ consisting of two somewhat blunt sensory rods and two guard setae. Ant. IV apically with two sensory papillae, but without blunt sensory setae (Fig. 5); Ocelli 8+8, of which apical two are a little larger than others (Fig. 6). Postantennal organ absent.

Thorax: Th. I distinct and with some setae. Unguis with an inner tooth; unguiculus vestigial; tenent hair acuminate (Fig. 4).

Abdomen: Ventral tube with 5+5 setae (Fig. 7). Tenaculum with 4+4 teeth, without setae

(Fig. 8). Furcula well developed, length ratio to body ca. 0.4. Ventral surface of manubrium without setae. Dens ca. 20 with setae only on dorsal surface, curving inside; distally with granules forming transverse rings; ca. 3 times as long as manubrium; mucro lamellate; entirely covered with granules (Fig. 2 and Fig. 9).



Figs. 1–9 *Podura aquatica* Linnaeus, 1758

图1–9 水生原舐

1. habitus 整体图; 2. mucro 端节; 3. mandible 上颚; 4. hind claw 后爪; 5. Ant. III and IV 触角第Ⅲ节和第Ⅳ节;
6. eyes 眼; 7. ventral tube 腹管; 8. tenaculum 握弹器; 9. dens and mucro 齿节和端节

Remarks: The present form well agrees with Christiansen & Bellinger (1998)^[7] except body length. But the body length agrees with that of Fjillberg (1998)^[8].

Specimens examined: 9 specimens (ZW98051, ZW98052, ZW98053, ZW98054, ZW98055, ZW98056, ZW98057, ZW98058, ZW98059), collected from water surface of a pond and stone surface

nearby a pond in Shanghai Botanical Garden. 18. V. 1998; Q. Yue leg.

Distribution: cosmopolitan.

***Hypogastrura yinae* Yue et Fu sp. nov.** (Figs. 10~22)

Body length: 1.2~1.3 mm.

Colour: dark brown. Body setae all simple.

Head: Antennae shorter than head. Length ratio of Ant. I : II : III : IV as 3:3:3.4:4. Ant. III organ consisting of 2 sensory rods and two long guard sensilla. Ant. IV with 4 blunt sensilla and a bilobed sensory papillae (Fig. 11). Postantennal organ in an integumental furrow, consisting of 4 simple elements; Ocelli 8+8 on each eye patch (Fig. 12).

Thorax: Th. I, II and III 80, 120 and 96 μm long respectively; chaetotaxy as shown in Fig. 13; dorsal axial setae pairs as 1, 3, 3. Unguis with an inner tooth; unguiculus with broad basal lamella, length ratio to unguis is 0.4 (Fig. 15). Tenent hair acuminate.

Abdomen: Abd. I ~ VI 118.2, 118.2, 108.4, 137.9, 118.2 and 88.6 μm long respectively; chaetotaxy as illustrated in Figs. 18, 19 and 22; dorsal axial setae pairs as 2, 2, 2, 2, 1, 1. Anal spines 1+1 on papillae, 39 μm long, 1.2 in ratio to unguis; papillae are about 1/2 as long as anal spines; Tenaculum with 4+4 teeth, without setae (Fig. 20). Ventral tube with 4+4 setae. Furcula well developed; dens with 7 setae; length ratio of murco to dens 0.4 (Fig. 14). Female genital aperture with 13 setae, of which one is on median line (Fig. 16). Anal lobes with 17+17 setae (Fig. 22).

Remarks: This new species is closely related to *Hypogastrura communis* in body chaetotaxy, but is different from the latter in body setae which are all simple and smooth. Body setae all ciliate in *H. communis*.

Holotypes: 1♀ (ZW98025), collected from water surface of a pond in Shanghai Botanical Garden, 26. II. 1998, Q. Yue leg.

Paratypes 7 ♀ (ZW98023, ZW98024, ZW98027, ZW98028, ZW98029, ZW980210, ZW980211), data same as for holotypes, collected together with the holotypes.

***Isotomurus palustris* (Müller, 1776)** (Figs. 23~30)

Synonym: *Podura palustris* Müller, 1776

Body length: 2.0 mm.

Colour: pale gray, with a median pigment spot on head.

Head: Antennae much longer than head, length ratio to head 2.0. Ant. III organ apically with two rods in an integumental fold (Fig. 27). Ant. IV with a pin seta apically. Eye patches dark, with 8+8 Ocelli (Fig. 25). Postantennal organ simple, elliptical; long axis subequal to diameter of nearby ocellus (Fig. 25). Chaetal arrangement on labrum as 4/6, 5, 4; labral papillae with 4 apical papillae (Fig. 24).

Thorax: Th. I not distinct, Th. II and III equal in length. Unguis simple, without teeth; unguiculus about 2/5 as long as unguis (Figs. 26 and 30).

Abdomen: Length ratio of Abd. I : II : III : IV : V : VI as 11:16:20:18:9:9. Ventral tube with ca. 24 setae on frontal surface and 6 setae on each flap. Tenaculum with 4+4 barbs and 12 setae on corpus

Figs. 10~22 *Hypogastrura yinae* Yue et Fu sp. nov.图 10~22 尹氏球角昉 *H. yinae*, 新种

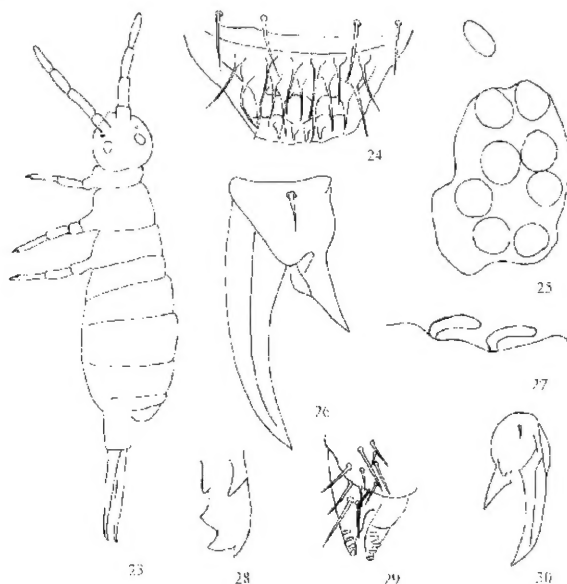
10. chaetotaxy on head 头部毛序; 11. sensilla on Ant. III and IV 触角 III、IV 节上的感受器; 12. postantennal organ and eyes 角后器和眼; 13. chaetotaxy of Th. I, II (left half) 胸部 I、II 节左半侧的毛序; 14. dens and mucro 端节和齿节; 15. fore claw 前爪; 16. female genital aperture 雌性生殖板; 17. mandible 上颌; 18. chaetotaxy on Abd. IV (left half) 腹部 IV 节左半侧毛序; 19. chaetotaxy on Abd. III 腹部 III 节毛序; 20. tenaculum 握弹器; 21. habitus 整体图; 22. chaetotaxy of Abd. V and VI 腹部 V、VI 节毛序

(Fig. 29). Furcular well developed; length ratio to body 0.4. Manubrium: dens is 1:2; mucro without basal setae, pentateethed (Fig. 28).

Remarks: The present form from Shanghai is somewhat different from the typical form of the species in lacking a corner tooth on unguiculus. But the other diagnostic characters well agree with that of the typical form.

Specimens examined: 3 specimens (ZW98021, ZW98044, ZW980510), collected from pond surface in Shanghai Botanical Garden. 26. II. 1998; 14. IV. 1998; 18. V. 1998; Q. Yue leg.

Distribution: cosmopolitan.



Figs. 23~30 *Isotomurus palustris* (Müller, 1776)

图 23~30 沼生陷等昉

23. habitus 整体图; 24. labrum 上唇; 25. postantennal organ and eye 角后器和眼; 26. hind claw 后爪; 27. sensory rods of Ant. III 触角 III 节感受器; 28. mucro 端节; 29. tenaculum 握弹器; 30. fore claw 前爪

***Sminthurides aquaticus* (Bourlet, 1843), New record in China (Figs. 31~43)**

Synonym: *S. amicus* Folsom, 1896

Body length: female, 1 mm long; male, 0.56 mm long.

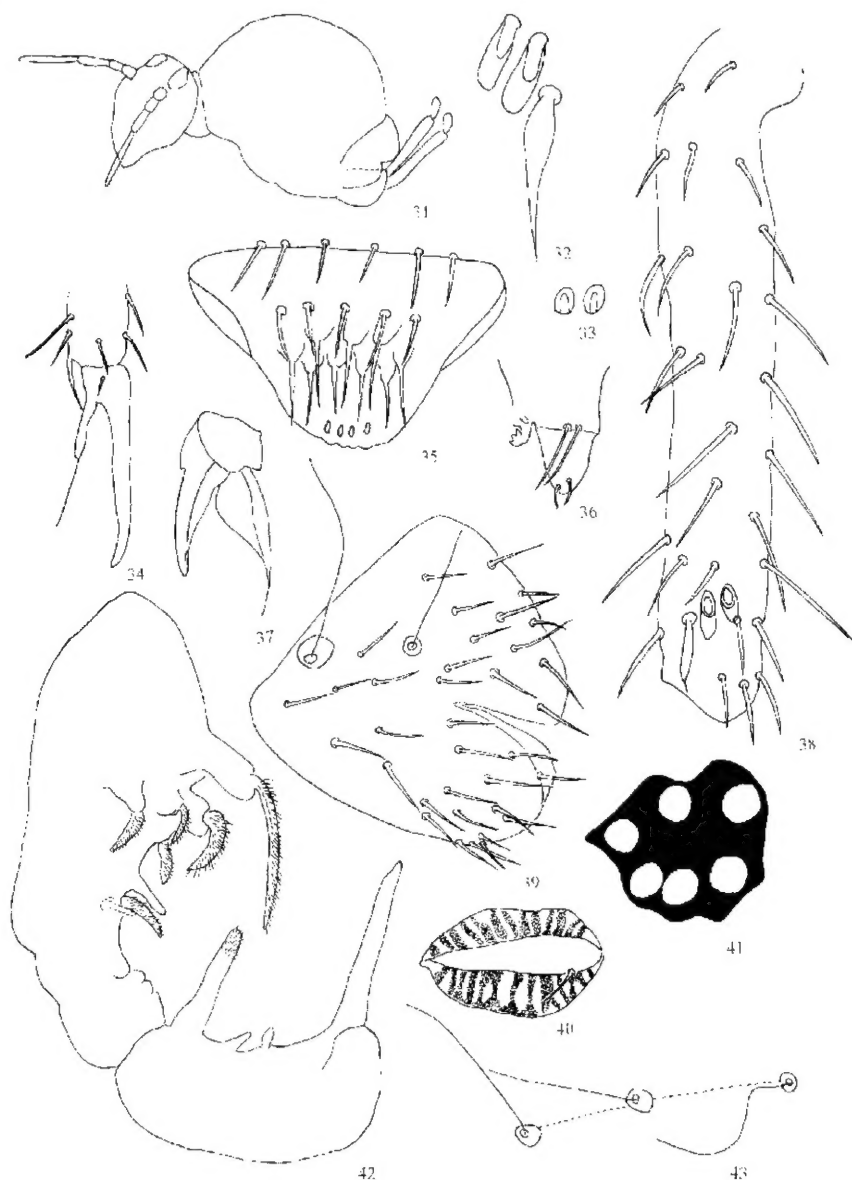
Colour: dark blue.

Head: Antennae of male specialized into clasping organ, composed of 7 ciliated setae and a smooth one on ventral side of Ant. II and 2 stout and 2 small processes on Ant. III (Fig. 42); Ant. IV tending to divide into subsegments; a pair of sensory rods completely concealed in integumental fold (Fig. 33). Ocelli 6 + 6 (Fig. 41). Chaetal arrangement on labrum as 6/5, 5, 4; median two of prelabrum shorter than others; proximal row of labrum setae not on papillae (Fig. 35).

Body with 3 moderately long bothriotrichia arranged in a line (Fig. 43). Fore unguis much slender and longer than hind one (Figs. 34 and 37); tibiotarsal organ on hind leg as Figs. 32 and 38. Ventral

tube with one setae on each flap. Tenaculum with 3 bards and 4 setae on corpus (Fig. 36). Furcula well developed; mucro lamellate with a basal seta, specialized into reniform to adapt for life on water surface (Fig. 40).

Remarks: The present form well agrees with the typical form of the species except for the number of specialized setae on Ant. II (8 specialized setae forming the clasping organ in the present form, but 7 in the typical form).



Figs. 31~43 *Sminthurides aquaticus* (Borulet, 1842)

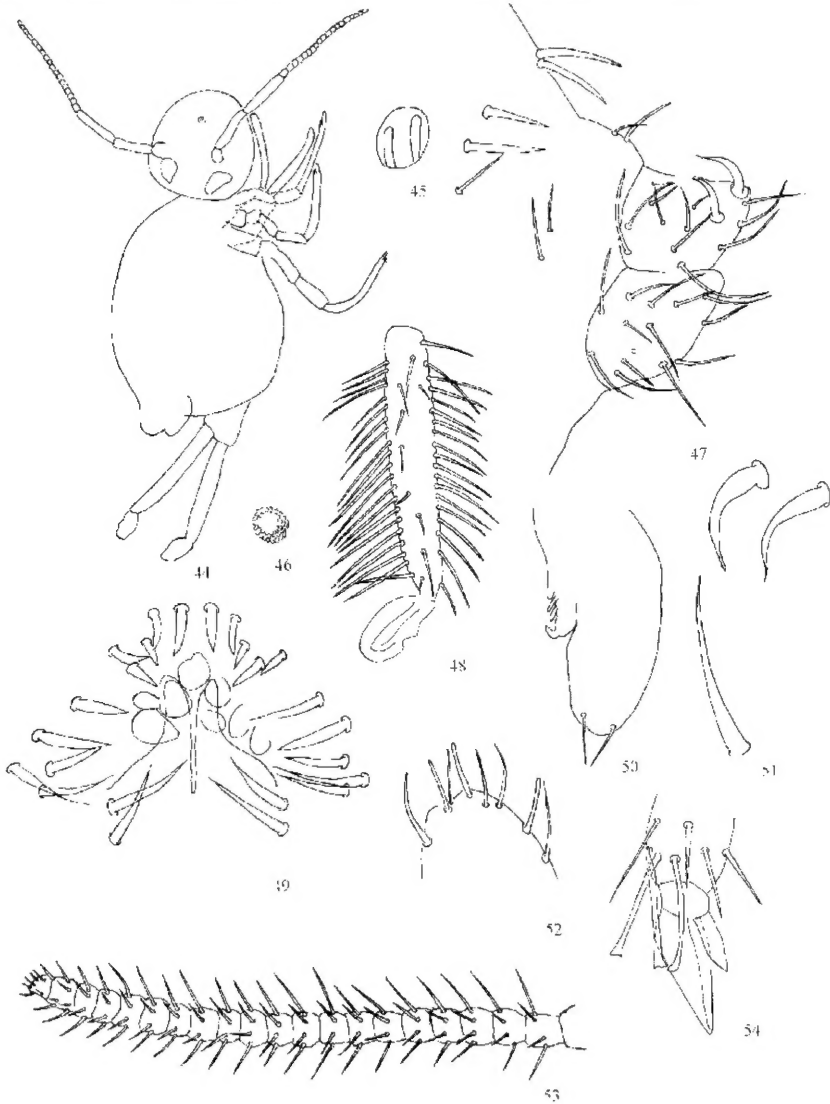
图 31~43 水生握角圆舐

31. habitus 整体图; 32. tibiotarsal organ 胫附器; 33. sensory rods of Ant. III 触角III节感受器;
34. fore claw 前爪; 35. labrum 上唇; 36. tenaculum 握弹器; 37. hind claw 后爪; 38. tibiotarsal
segment 胫附节; 39. anal lobe 肛板; 40. mucro 端节; 41. eye patch 眼区; 42. clasping organ
of male 雄虫的抱握器; 43. bothriotrichia 陷毛

Specimens examined: 8 specimens (ZW980212, ZW980213, ZW980214, ZW980215, ZW980216, ZW980217, ZW980218, ZW9802119), collected from water surface of a pond in Shanghai Botanical Garden, 26. II. 1998.

Distribution: cosmopolitan.

Pseudobourletiella spinata (MacGillivray, 1893), New record in China (Figs. 44~54)



Figs. 44~54 *Pseudobourletiella spinata* (MacGillivray, 1893)

图 44~54 刺拟勃氏圆盼

44. habitus 整体图; 45. sensory rods of ant. III 触角 III 节感受器; 46. alveoli between eye patches 眼区之间的毛窝;
47. clasper organ and anal lobes of male 雄虫的肛板和抱握器; 48. dens and mucro 端节和齿节; 49. nasal organ of male 雄虫的鼻器; 50. tenaculum 握弹器; 51. specialized setae forming clasper organ 形成抱握器的特化刚毛;
52. apical section of Ant. IV 触角 IV 节顶端; 53. Ant. IV 触角 IV 节; 54. hind claw 后爪

Synonym: *P. chandleri* Pedigo, 1968

Body length: male, 1.8~1.9 mm.

Colour: olive green.

Head: Length ratio of Ant. I : II : III : IV as 2:5:7:13. Ant. IV with ca. 20 subsegments; apically without sensory papillae, but with blunt sensory setae (Fig. 53). Ant. III organ composed of two sensory rods in an integumental fold (Fig. 45). Eye patches dark; alveoli between which are flowerlike. Postantennal organ absent, but nasal organ consisting of 12 + 12 specialized setae surrounding many bursiform papillae (Fig. 49).

Thorax and abdomen: Body with 3 bothriotrichia arranged in a line. Tibiotarsus with 3 clavate tenent hairs (Fig. 54). Unguis without teeth; unguiculi of fore and midlegs shorter than that of hind leg which is about 1/2 as long as unguis. Tenaculum with 4 + 4 teeth; corpus large, with a pair of setae near apex (Fig. 50). Furcula well developed; dens with a row of about 19~21 long, stout setae on each side; dental seta about 2 times as long as width of dens; mucro lamellate; ration of dens to mucro as 3.5. Clasp organ of male composed of two flattened spines near apex of anal papillae and a set of three macrosetae on each side of mid-dorsal line of greater abdomen. Anal papilla without anal appendages.

Remarks: The present form well agrees with the typical form of the species^[7,9].

Specimens examined: 2 ♂♂ (ZW98046, ZW980512), collected from the water surface in Shanghai Botanical garden, 18. V. 1998, and 16. VI. 1998; Q. Yue leg.

Distribution: North America.

Acknowledgements The authors wish to thank Professor H. Tamura, Japan, for his kind check of the manuscript.

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中国水生跳虫新种及新记录种记述 (弹尾目)

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摘要: 自 Uchida (1948) 从山西东冶县发现中国第 1 种水生昉 *Podura aquatica* Linnaeus, 1785 以来, 中国弹尾目水生种类再未见报道。该文记述了采自上海植物园水塘静水表面的弹尾目 5 新种, 水生原昉 *Podura aquatica*, 尹氏球角昉 *Hypogastrura yinae* sp. nov., 沼生陷等昉 *Isotomurus palustris*, 水生握角圆昉 *Sminthurides aquaticus* 及刺拟勃氏圆昉 *Pseudobourletiella spinata*。其中水生握角圆昉和刺拟勃氏圆昉为中国新记录种, 尹氏球角昉为新种。新种的模式标本及观察的其它种的标本存放在中国科学院上海昆虫研究所标本馆。

关键词: 弹尾目; 新种; 新记录; 中国

中图分类号: Q969.14 **文献标识码:** A